THURSDAY, MARCH 21, 1912.

AN ENGLISH PHYSIOLOGIST.

Sir John Burdon-Sanderson: a Memoir by the late Lady Burdon-Sanderson. Completed and edited by his Nephew and Niece. With a selection from his papers and addresses. Pp. 315. (Oxford: Clarendon Press, 1911.) Price 10*s*. 6*d*. net.

SIR JOHN BURDON-SANDERSON belonged to that golden age of natural science, the second half of the nineteenth century. Born at the close of the year 1828, he was privileged to share in, and gifted to profit by, the wealth of discovery and conception which enriched biological knowledge from 1850 to 1880. There are many notable names in this period, Bernard, Helmholtz, Ludwig, du Bois-Reymond, Darwin, Huxley, Hooker, Pasteur, and Lister; and among these Burdon-Sanderson takes an honoured place; it is therefore fitting that some record should exist of his life and work. In his speech at Edinburgh Pasteur, in 1884, recalled with enthusiasm Robert Flint's exhortation to "remember the past and look to the future," and impressed on the students whom he was addressing the advice to "associate the cult for great men and great things with every thought." The present memoir, begun by the late Lady Burdon-Sanderson, and completed by Dr. J. S. Haldane and Miss Haldane, is a laudable effort towards the fostering of this cult. It deals with one who was intimately associated with the rise of modern English physiology, and is justly regarded as the founder of scientific pathology in this country.

In physiology Sanderson was not only an exact investigator, but the upholder of sound experimental methods; indeed, he extended these to the teaching of the subject, thus changing the character of such teaching from the didactic to the experimental type. In pathology his influence was still more potent, as he was the first to undertake for sanitary purposes the carrying out of pathological investigations along strictly scientific lines and by rigorously exact methods; it is not too much to say that the great developments of pathological and sanitary science which have taken place in England were started by his investigations and his influence.

All this is set forth in the memoir, which must therefore be of special interest to the scientific reader. In the early chapters a pleasant and graphic account is given of Sanderson's youth, education, and early scientific training. This part was written by Lady Burdon-Sanderson, and is full of interest; it is simply set forth, but as it was evidently a labour of love it gains in force by its very simplicity, particularly when, as frequently happens, vivid touches reveal some striking traits of Sanderson's personality. If the test of effective biography be its power to create in the mind of the reader a picture of the kind of man who forms the subject of the biographer, then, as far as they go, these early chapters will endure this test. Nor is such presentation unimportant, for, like many notable men, Sanderson was pre-eminently a personality It was his impressive character which gave him such influence over others, and which, when taken in connection with his gifts and scientific achievements, became almost overwhelming. He was one of the world's gifted sons, but in addition he was essentially a sympathetic intellectual. This was realised not only from his speech and manner, but from his face and form, so that the value of his approval or criticism was greatly enhanced through his personality and bearing.

The chapters which, as mentioned above, describe his family circle and his development bring before the reader this personality, and the necessity for a rational basis of conception, combined with the display of sympathetic toleration and interest, is here displayed as the keystone of his temperament.

The later chapters which describe his scientific career in London, and later in Oxford, are not so happy as regards their setting. The narrative is somewhat broken up through the introduction of written statements and extracts from obituary notices, so that the effect of the whole is impaired. The quotations from the numerous documents sent to Lady Burdon-Sanderson for the purpose of the memoir, deal in some cases with similar aspects of Sanderson's life and work, and in this way there is considerable overlapping, with its resulting diminution of interest. No doubt it was a task of some difficulty to piece together the fragments left by Lady Burdon-Sanderson and, in doing so, to mould the whole into a continuous and effective narrative. It is to be feared, therefore, that Sanderson's scientific achievements, extending as they do over a rather large biological field, will be scarcely appreciated by many readers. The importance of his discoveries in electro-biology, of his modifications in physiological teaching, of his epoch-making reports to the Privy Council on tuberculosis and allied subjects, and of his work at Oxford as the real founder of her medical school, is not so manifest as it might have been owing to the arrangement of this part of the memoir. But the account is in itself fairly complete, and it is emphasised by appending to the memoir a selected number of addresses given

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by Sanderson on various occasions. These add to the value of the whole book, since they afford a ready means of appreciating Burdon-Sanderson's intellectual point of view in relation to biological problems.

The last chapter of the memoir gains in interest because it is devoted to the consideration of his personal characteristics and opinions. Such consideration is the salt of most biographical writings, and derives the chief part of its piquancy from the necessary introduction of the biographer's own view as to the nature of the opinions held by the subject of his account. It need scarcely be said that the essence of the piquant interest is the circumstance that the biographer now treads on ground which is open to criticism.

The present memoir offers, in its last chapter, a fair mark for comment when it implies that Burdon-Sanderson came to regard biological phenomena from what in these days would be called the "neo-vitalistic" point of view. The writings of a sympathetic intellectual, like Burdon-Sanderson, must of necessity contain statements which might give some colour for this implication, but the memoir brings forward as pertinent to the matter a letter written by Sanderson a year before his death. In this he expresses the view that a biological excitatory process (*i.e.* the condition of tissue activity) is something "organismal," by which he means "involved in organism." It is by no means clear what this connotes, but at least it is clear what in his opinion it does not connote, for he goes on to say that organismal changes, as such, are not measurable, that is, cannot be stated in terms of physics and chemistry. The writers of the memoir infer from this that Sanderson

> "had come to the conclusion that physiological processes involve something which is neither physical nor chemical in nature, and which is not a mere mysterious accompaniment of these processes, but which is their essential part" (p. 169).

But in the letter already referred to Sanderson explicitly states that in science "nothing that is not measurable is known"; and it may be confidently asserted that he would never have allowed the scientifically unknowable to be incorporated in the sum of what constitutes physiological or pathological science. An organismal or vitalistic essence may find a place in other realms of knowledge, but not in one which claims to be a branch of science.

Burdon-Sanderson does not appear, therefore, to have departed fundamentally from the view which he expressed so often and so emphatically during his active scientific career and which is acknowledged in the memoir (p. 170). This view bases modern physiology on the introduction of physical and chemical methods of experiment and explanation. Some notes made by him as late as 1903 upon "The Pathway to Reality" (the Gifford lectures of his nephew, the present Viscount Haldane) show that he then still entertained the same opinion, since he wrote that "all discovery in biology is the discovery of the operation, where before concealed, of mechanical and chemical principles" (memoir, p. 168).

Whatever may be the issue as regards the adoption of more vitalistic conceptions in the future, it seems clear that a rational point of view, such as was the mainstay of biological progress in the latter half of the nineteenth century, was one which Burdon-Sanderson deliberately adopted; and it appears that he adhered to it throughout his life.

The memoir contains a curious oversight on the first page as to the year of Sanderson's birth, this being given as 1829 instead of 1828. It is embellished by at least one admirable and hitherto unknown likeness (p. 148), this being printed from a photograph taken by Miss Acland during Sanderson's later life in Oxford.

GEOLOGY OF THE PARIS BASIN.

Géologie du Bassin de Paris. By M. Paul Lemoine. Pp. vi+408. (Paris: A. Hermann et Fils, 1911.) Price 15 francs.

THE author of this work is already known to us as one of the compilers of the geological map of France, as also for his valuable researches on the geology of Madagascar and Morocco. The present volume treats of an area which geologically has, perhaps, been more completely studied than any other part of the world by such eminent authorities as Lamarck, Cuvier, Brongniart, Orbigny, Deshayes, Hébert, Barrois, de Lapparent, G. F. Dollfus, Cossmann, H. Douvillé, and a host of others. Some eight hundred titles of books and papers arranged alphabetically under authors' names form the bibliography, although, we are informed, this is by no means to be regarded as a complete list of the literature.

Preliminary remarks are made on the subjects of stratigraphy, petrography, palæontology, and tectonics. These are followed by a full account of the various deposits extending from Triassic to Quaternary times, due recognition being given to all zonal subdivisions of the rocks, with their index and characteristic fossils, a matter of so much importance especially in the true history of the Mesozoic formations. All such details are well arranged under the numerous localities represented in the Paris Basin.

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